STEREO INTEGRATION AND TEST FLOW

JOE STAIGER

joseph.staiger@jhuapl.edu

SPACE DEPARTMENT

INTEGRATION AND TEST CONCEPTS

- *TEST PHILOSOPHY WILL BE BASED ON APL DOCUMENT SDO 2387-1, MIL- STD-1540B, AND GEVS-SE Rev A.*
- *WILL TEST AND OPERATE TWO SPACECRAFT AS ONE SPACECRAFT WITH A SIDE 1 AND 2.*
- *EACH SPACECRAFT WILL HAVE ITS OWN GROUND SUPPORT EQUIPMENT (GSE). POWER RACK INTERFACE, RF RACK INTERFACE, AND ANY OTHER GSE SIMULATORS (SOLAR ARRAY, BATTERY CHARGER,ETC)*

INTEGRATION AND TEST CONCEPTS

- *STEREO (2) SPACECRAFT WILL BE INTEGRATED AND TESTED IN APL CLEANROOM FACILITIES AND GSFC FACILITIES.*

- *SUBSYSTEMS AND INSTRUMENTS WILL BE DELIVERED TO THE (2) SPACECRAFT, FLIGHT QUALIFIED WITH THEIR RESPECTIVE GSE'S.*

- *THE MISSION OPERATIONS TEAM WILL BE COMBINED WITH THE I & T TEAM TO PROVIDE SPACECRAFT FAMILIARITY AND OPERATING EXPERIENCE.*

TEST OBJECTIVES

- *TEST THE (2) STEREO SPACECRAFT UNDER AMBIENT CONDITIONS AND SIMULATED ENVIRONMENTS EXPECTED TO OCCUR DURING LAUNCH PREPARATIONS, LAUNCH, AND IN ORBIT.*

- *ESTABLISH CORRECT OPERATIONS OF ALL SUBSYSTEMS AND INSTRUMENTS, WHEN INTERCONNECTED AS A SPACECRAFT, CONFIRMING ALL ELECTRICAL INTERFACES TO BE IN COMPLIANCE WITH SPECIFICATIONS AND/OR INTERFACE CONTROL DOCUMENTS.*

TEST OBJECTIVES

- *VALIDATE SPACECRAFT SYSTEM PERFORMANCE THROUGH TESTING.*

- *VALIDATE ACCEPTABLE QUALITY OF WORKMANSHIP BY DEMONSTRATING PERFORMANCE UNDER MISSION-LEVEL ENVIRONMENTAL STRESS.*

- *DEVELOP A DATA BASE AND EXPERTISE TO UNDERSTAND POSSIBLE MALFUNCTIONS SO REMEDIAL ACTION CAN TAKE PLACE IN A TIMELY MANNER SO AS NOT TO AFFECT THE PROGRAM SCHEDULE.*

ESTIMATED TIMES TO INTEGRATE AND TEST ALL OF THE (2) STEREO SPACECRAFT SUBSYSTEMS AND INSTRUMENTS. USING COMPUTERIZED TEST PROCEDURES

STEREO 1 & 2 POWER ELECTRONICS	*TIME*
POWER ELECTRONICS (PS RELAYS, PEAK POWER TRACKER, & POWER SHUNT/FUSE BOX)	*4 WKS.*
BATTERIES (simulators used during I&T)	
SOLAR ARRAYS (solar array simulators used during I & T)	

STEREO 1 & 2 C&DH ELECTRONICS AND RF SUBSYSTEM

TELEMETRY INTERFACE	*TIME*
RECORDERS	*6 WKS.*

C&DH PROCESSOR

ULTRA STABLE OSC.

X-BAND UPLINK

X-BAND DOWNLINK

RF POWER AMPLIFIER

RF SWITCHES & DIPLEXERS

HIGH-GAIN,MED-GAIN,AND LOW-GAIN ANTENNAS

(WITH HIGH-GAIN ANT. GIMBAL)

STEREO 1 & 2 ATTITUDE GUIDANCE AND CONTROL

ATTITUDE INTERFACE ELECTRONICS	*TIME*
FLIGHT COMPUTER	*4 WKS.*
(3) REACTION WHEELS & ELECTRONICS	
INERTIAL MEASUREMENT UNIT (GYROS)	
STAR TRACKER	
COLD GAS PROPULSION SYSTEM	
HIGH RESOLUTION SUN SENSOR & ELECTRONICS	
(2) SUN SENSORS (HEADS) & ELECTRONICS	
INSTRUMENT DATA PROCESSING UNIT (DPU)	

STEREO 1 & 2 INSTRUMENTS	*TIME*
■ *HELIOSPHERIC IMAGER (HI)*	*2 WKS.*
■ *ENERGETIC PARTICLE DETECTOR (EPD)*	*2 WKS.*
■ *RADIO BURST TRACKER (RBT)*	*2 WKS.*
■ *MAGNETOMETER & ELECTRONICS*	*2 WKS.*
■ *SOLAR WIND PLASMA ANALYZER (SWPA)*	*2 WKS.*
■ *SOLAR CORONAL IMAGING PACKAGE (SCIP)*	*2 WKS.*

STEREO 1 & 2 ORDNANCE AND THERMAL SYSTEMS

	TIME
■ *MECHANICAL AND ELECTRICAL TESTING OF ALL PYRO-ORDNANCE SYTEMS . (BOOMS, DEPLOYERS, ETC.)*	*1 WK.*
■ *INTEGRATE AND TEST THERMAL SYSTEM.. (INSTALL MULTI-LAYER INSULATION,ETC.)*	*1 WK.*
■ *STEREO 1 & 2 BASELINE ELECTRICAL PERFORMANCE AND DSN COMPATILBILITY TESTING (JPL DSN TRAILER)*	*2WKS.*

TOTAL ESTIMATED TIME TO I & T (2) SPACECRAFT...30 WKS. (7 MONTHS)

ESTIMATED TIME TO ENVIRONMENTALLY TEST STEREO 1 & 2 SPACECRAFT

■ *PREPARATION FOR (2) SPACECRAFT VIBRATED IN SERIES. (MOVE TO VIBRATION FACILITY, INSTRUMENT WITH ACCELEROMETERS, FILL PROPULSION SYSTEM, MOUNT TO SHAKER, AND PERFORM PRE-VIBRATION ALIVENESS TESTS.*	*TIME 1 WK. APL*
■ *VIBRATION TESTING (3 AXIS,WITH FUNCTIONAL TEST BETWEEN EACH AXIS, (2) SPACECRAFT IN SERIES). PERFORM ALIGNMENT CHECKS PRE & POST VIBRATION.*	*2 WKS. APL*

ENVIRONMENTALLY TESTING (2) STEREO SPACECRAFT IN SERIES.

	TIME
ACOUSTIC AND SHOCK TESTING.	*1WK.*
■ *SHIP (2) STEREO SPACECRAFT TO GSFC UNPACK AND SETUP WITH GSE IN ACOUSTIC CELL.*	*(GSFC)*
■ *PERFORM ACOUSTIC & SHOCK WITH PRE &POST FUNCTIONAL ELECTRICAL TESTS AND PRE &POST ALIGNMENT CHECKS.*	*1 WK. (GSFC)*

ENVIRONMENTALLY TESTING (2) STEREO SPACECRAFT IN SERIES.

■ *SETUP FOR MASS PROPS. AND SPIN BALANCE TESTS IN ACOUSTIC CELL. (SPIN TABLE IN ACOUSTIC CELL)*	*TIME 1 WK. (GSFC)*
■ *PERFORM MASS PROPS. AND SPIN BALANCE TESTING WITH POST FUNCTIONAL ELECTRICAL TESTS. AND ALIGNMENT CHECKS.*	*1 WK. (GSFC)*

ENVIRONMENTALLY TESTING (2) STEREO SPACECRAFT.

- *PREPARE AND SETUP (2) SPACECRAFT IN THE THERMAL VACUUM CHAMBER AT GSFC.* *TIME 1 WK.*
- *THERMOCOUPLES, HEATER SHROUDS,CABLING, ETC.* *(GSFC)*
- *PERFORM THERMAL VACUUM BALANCE AND CYCLING* *4 WKS.*
- *TEST WITH FULL PERFORMANCE ELECTRICAL TESTS PERFORMED ON EACH SPACECRAFT AS SIDE 1 (S/C 1) AND SIDE 2 (S/C 2). GSE & GSS SUPPORTING EACH S/C* *(GSFC)*
- *BREAK FROM CHAMBER, ALIGNMENTS, PACK & SHIP.* *1 WK.*
- ***TOTAL ESTIMATED ENVIRON. TEST TIME.... 13 WKS. (3 MONTHS)***

STEREO (2) SPACECRAFT INTEGRATED AND TESTED AS ONE (WITH A SIDE 1 AND SIDE 2)